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ABSTRACT

A within-subjects, three condition design was employed to examine the effects of three relaxation techniques on blood pressures, pulse rates, and self-report measures of relaxation for 12 college students. Respiratory Manipulation Training incorporated instructions to exhale and not to inhale for as long as possible. When breathing could no longer be restrained, students inhaled and attended to the relief experienced. Next, two deep-breathing cycles were completed, and then voluntary respiratory arrest was resumed. The respiratory-arrest/deep-breathing sequence was repeated, without rest, for the duration of the technique. Progressive muscle relaxation followed the standard four-major-muscle-group, tension/release procedure. Pleasant imagery involved instructions to develop preselected scenes, while random stimulus and response propositional prompts were offered to enhance imagery. All techniques lasted 15 minutes and were reproduced, via audio cassette, to control for experimenter bias and stimulus variation. Order of technique presentation was counterbalanced, while modified, 5-minute, Stroop effect exercises were utilized to restore students to pretechnique physiological levels. An analysis of the results revealed that Respiratory Manipulation Training reduced systolic and diastolic blood pressures significantly greater than the other two techniques. These results may be due to the combination of relief and relaxation responses inherent in the respiratory manipulation. (Author/BL)

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# A PSYCHOPHYSIOLOGICAL COMPARISON OF THE EFFECTS OF THREE RELAXATION TECHNIQUES: RESPIRATORY MANIPULATION TRAINING, PROGRESSIVE MUSCLE RELAXATION, AND PLEASANT IMAGERY

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## ABSTRACT

A within subjects, three condition design was employed to examine the effects of three relaxation techniques on blood pressures, pulse rates, and self-report measures of relaxation for twelve college students. Respiratory Manipulation Training incorporated instructions to exhale and not to inhale for as long as possible. When breathing could no longer be restrained, students inhaled and attended to the relief experienced. Next, two deep-breathing cycles were completed, and then voluntary respiratory arrest was resumed. The respiratory-arrest/deep-breathing sequence was repeated, without rest, for the duration of the technique. Progressive muscle relaxation followed the standard four-major-muscle-group, tension/release procedure. Pleasant imagery involved instructions to develop preselected scenes, while random stimulus and response propositional prompts were offered to enhance imagery. All techniques lasted 15 minutes and were reproduced, via audio cassette, to control for experimenter bias and stimulus variation. Order of technique presentation was counterbalanced, while modified, five-minute, Stroop effect exercises were utilized to restore students to pretechnique physiological levels. Mixed, repeated measures, analyses of variance revealed that Respiratory Manipulation Training reduced systolic and diastolic blood pressures significantly greater than the other two techniques. Theoretical implications for these effects are discussed, along with clinical applications.

A Psychophysiological Comparison of the Effects of Three Relaxation Techniques: Respiratory Manipulation Training, Progressive Muscle Relaxation, and Pleasant Imagery

Progressive muscle relaxation is one of the most widely used behavioral techniques in clinical practice today (Lehrer, 1982). It has been applied to the treatment of anxiety and stress reduction (Woolfolk & Lehrer, 1984); vascular headaches (Jurish, Blanchare, Andrasik, Teders, Neff, & Arena, 1983); essential hypertension (Agras, Southam, & Taylor, 1983); acne vulgaris (Hughes, Brown, Lawlis, & Fulton, 1983); and insomnia (Woolfolk & McNulty, 1983). There are, however, several difficulties with the technique. Bernstein and Borkovec (1973) report a 'wide variety of difficulties occur during all phases of training ranging in both nature and content'. They emphasize that some clients: can not focus their attention; develop muscle cramps; can not differentially tense/relax muscle groups; are unable to concentrate on the technique; and/or develop muscle spasms and tics. Additionally, Bernstein and Borkovec (1973) advise clinicians to train clients over the course of several therapeutic sessions, with home-based practice periods lasting 15 minutes, performed at least twice a day. Thus the time involved (both clinician and client) in mastering progressive muscle relaxation is substantial. In response to the difficulties associated with progressive muscle relaxation, Respiratory Manipulation Training has been proposed (Longo & vomSaal, 1984).

Respiratory Manipulation Training is a hybrid of two

relaxation techniques, Respiratory Relief (Orwin, 1971) and Paced Respiration (Clark & Hirschman, 1980). The technique consists of instructions to breath out and not to inhale for as long as possible. When breathing can no longer be restrained, clients are to inhale and attend to the relief experienced. Following respiratory relief, two deep-breathing cycles are completed and then voluntary arrest is resumed.

Respiratory Manipulation Training has been shown to reduce physiological arousal in speech anxious college students significantly greater that either guided imagery plus exposure or a placebo control technique (Longo & vomSaal, 1984). Additonally, it has been effective in reducing self-report and physiological arousal in a client diagnosed with generalized anxeity disorder, and maintaining anxiety reductions at a six month followup period (Longo, 1984). The technique, however, has not been compared to progressive muscle relaxation along psychophysiological parameters. It is therefore the purpose of this study to examine the comparative effects of three relaxation technqiues on students' blood pressures, pulse rates, and self-report measures of relaxation.

## METHOD

### Subjects

Twelve college students were selected from a group of 37 volunteers on the bases of their initial blood pressure levels. Selection criterion was set at a blood pressure level of less

than 130/90 to exclude essential hypertensives from the study. All students received extra credit points to be applied to their final grade in an Introductory Psychology class.

Procedure

A within-subject, three condition design was employed to examine the effects of three relaxation techniques on blood pressures, pulse rate, and a self-report measure of relaxation. Relaxation instructions were reproduced by a cassette player to control for experimenter bias. All students were seen seperately, and each technique was demonstrated at the beginning of the session. Progressive relaxation followed the standard four-major-muscle-group tension/release procedure (Bernstein & Borkoec, 1973). Pleasant imagery involved a sample scene description. Students then were instructed to attend to their preselected scenes, while random stimulus and response prompts were offered to enhance imagery (Anderson & Borkovec, 1980). The third relaxation technique, Respiratory Manipulation Training, incorporated instructions to breath out and not to inhale for as long as possible. When breathing could no longer be restrained, students were to inhale and attend to the relief experienced. Following respiratory relief, two deep-breathing cycles were completed and then voluntary respiratory arrest was resumed. The respiratory-arrest/deep breathing sequence was repeated, without rest, for the duration of the technique. Each technique required about 15 minutes to complete. Order of presentation was counterbalanced,

while modified, five-minute, Stroop effect exercises were utillized to restore students to pretechnique physiological levels.

## RESULTS

A summary of the mean, pre and post, dependent measures, along with standard deviations are shown in Table 1. A visual inspection of the data indicates no great differences among the three relaxation conditions at pre-

**Insert Table 1 about here**

technique. However, a mixed, repeated measures, analysis of variance was conducted on blood pressures, pulse rate, and self-report measure of relaxation data to determine if order of technique had any significant effect on outcome. No significant ordering effects were found. Repeated measures, analyses of variance (Treatment x Phase of Treatment x Subject) were then used to compare the effects of the three relaxation techniques (Keppel, 1973). A summary of these results are shown in Table 2. Systolic blood pressure yielded significant Treatment, $F$ (2, 22) = 3.47, $p < .05$, and Phase of Treatment, $F$ (1, 11) = 5.62, $p < .05$, main effects. Furthermore there was a significant Treatment x

**Insert Table 2 about here**

Phase of Treatment interaction, $F$ (2, 22) = 6.50, $p < .025$, indicating that systolic blood pressure varied differently from pre- to posttreatment for each treatment technique. Subsequently, a comparison of specific means found the locus of the effect residing in the Respiratory Manipulation treatment, $F$ (1, 11) = 19.70, $p < .001$. This interaction is graphically illustrated in Figure 1. Similar repeated measures, analyses of variance were conducted for diastolic

**Insert Figure 1 about here**

blood pressure, pulse rate, and self-report measure of relaxation. Diastolic blood pressure displayed a significant Treatment main effect, $F$ (2, 22) = 3.46, $p < .05$, indicating that Respiratory Manipulation decreased diastolic blood pressure significantly greater than the other two treatments. This is shown in Figure 2. Pulse rate measures found treatment means in the same direction as blood

**Insert Figure 2 about here**

pressures (see Table 1), however this measure did not reach significance for either the Treatment main effect, or the interaction (re: Table 2). Pulse rates did decline significantly over each technique, $F$ (1, 11) = 5.25, $p < .05$, indicating that the students were relaxed by the techniques. Upon inspection of Figure 3, Respiratory Manipulation appears to display lower pulse rates, and hence

**Insert Figure 3 about here**

greater relaxation at posttechnique than the other two techniques. Finally, the self-report measure of relaxation followed the same trends as the pulse-rate data. No significant Treatment main effect or interaction was found, however there was a significant Phase of Treatment main effect, $F$ (1, 11) = 162.57, $p < .001$ (see Table 2). This effect also suggests that students were more relaxed at posttechnique than at pretechnique. Figure 4 shows this

**Insert Figure 4 about here**

effect and illustrates that the students reported more relaxation after Respiratory Manipulation Training than after the other techniques.

## DISCUSSION

Respiratory Manipulation Training was shown to reduce systolic and diastolic blood pressures significantly greater than either progressive muscle relaxation or pleasant imagery. These results may reflect the theoretical foundations of the techniques. Respiratory Manipulation has been hypothesized to utilize both a relief and relaxation response for the reduction of physiological arousal (Denny, 1976; Longo & vomSaal, 1984), whereas progressive relaxation employs only the relaxation reponse (Wolpe, 1973). Respiratory Manipulation therefore

elicits a more powerful, physiological , relaxation than progressive relaxation. Further research should be pursued, utilizing Respiratory Manipulation Training in other treatment regimens and behavioral medicine problem areas such as: Anxiety Management Training (Suinn & Richardson, 1971); stress inoculation (Woolfolk & Lehrer, 1984); coping (Barrios, 1978); vascular headaches (Jurish et al, 1983); essential hypertension (Agras et al, 1983); acne vulgaris (Hughes et al, 1983); and insomnia (Woolfolk & McNulty, 1983).

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Table 1

Summary of Dependent Measures

| Dependent Measure | Baseline | Res. Man. Train. | | Prog. Relax. | | Guided Imagery | |
|---|---|---|---|---|---|---|---|
| | | Pre | Post | Pre | Post | Pre | Post |
| Systolic Blood Pressure | 113.2 (12.5) | 108.2 (10.4) | 101.0 (8.9) | 108.5 (11.4) | 109.8 (10.6) | 107.2 (11.8) | 106.7 (10.8) |
| Diastolic Blood Pressure | 67.0 (10.2) | 67.5 (9.3) | 66.3 (10.1) | 68.0 (8.4) | 67.0 (10.1) | 68.3 (8.5) | 69.8 (7.9) |
| Pulse Rate (b.p.m.) | 70.8 (15.6) | 68.5 (12.3) | 65.5 (14.8) | 68.8 (13.2) | 68.8 (14.0) | 68.5 (14.6) | 66.5 (14.1) |
| Self-Report (Relaxation) | 4.8 (1.7) | 5.6 (1.9) | 8.2 (1.6) | 5.5 (1.6) | 7.6 (1.6) | 5.7 (1.3) | 8.0 (1.5) |

Note. ( ) Standard deviation.

Table 2

Summary of Repeated Measures Analysis of Variance

| Dependent Measure | Treatment Main Effect | Phase of Treatment (Pre / Post) | Treatment x Phase Treatment |
|---|---|---|---|
| Systolic Blood Pressure | 3.47* (2, 22) | 5.62* (1, 11) | 6.50** (2, 22) |
| Diastolic Blood Pressure | 3.46* (2, 22) | <1 (1, 11) | <1 (2, 22) |
| Pulse Rate (b.p.m.) | 2.17 (2, 22) | 5.25* (1, 11) | 1.47 (2, 22) |
| Self-Report (Relaxation) | <1 (2, 22) | 162.57*** (1, 11) | <1 (2, 22) |

*p < .05. **p < .025. ***p < .001.

Note. ( ) degrees of freedom

Figure 1. Mean systolic blood pressure: at baseline, before, and after each relaxation technique.

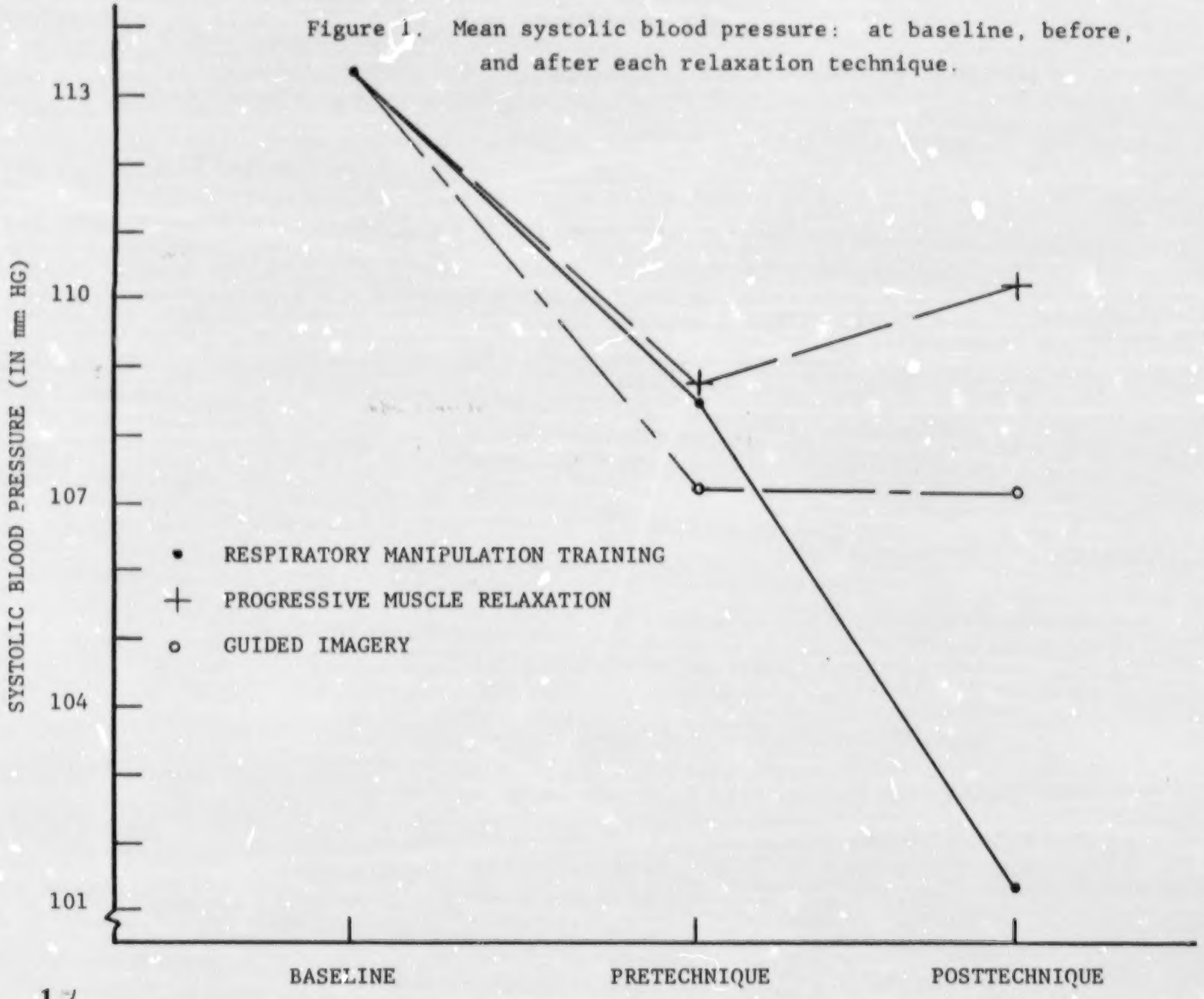


Figure 2. Mean diastolic blood pressure: at baseline, before, and after each relaxation technique.

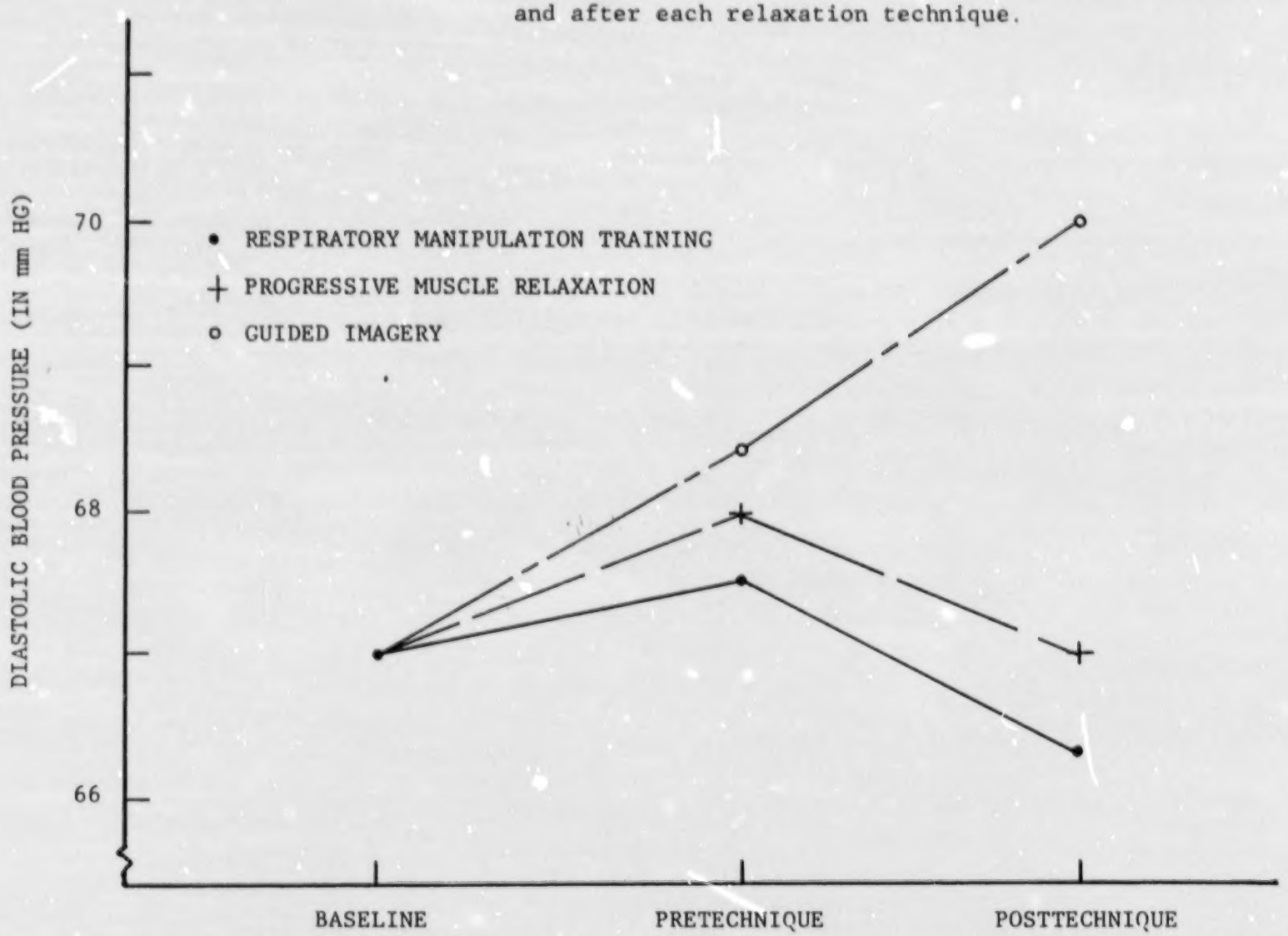


Figure 3. Mean pulse rate measures: at baseline, before, and after each relaxation technique.

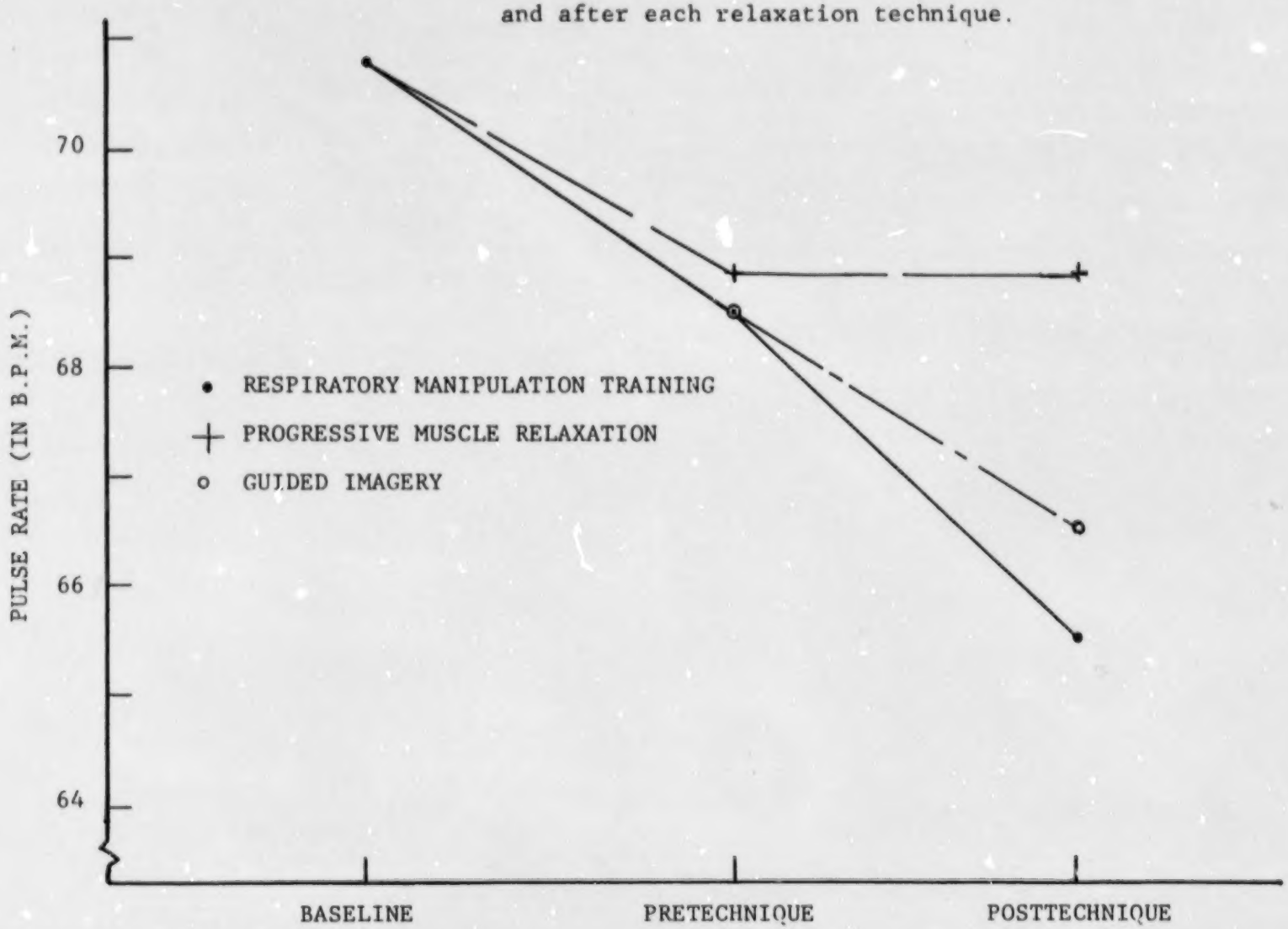
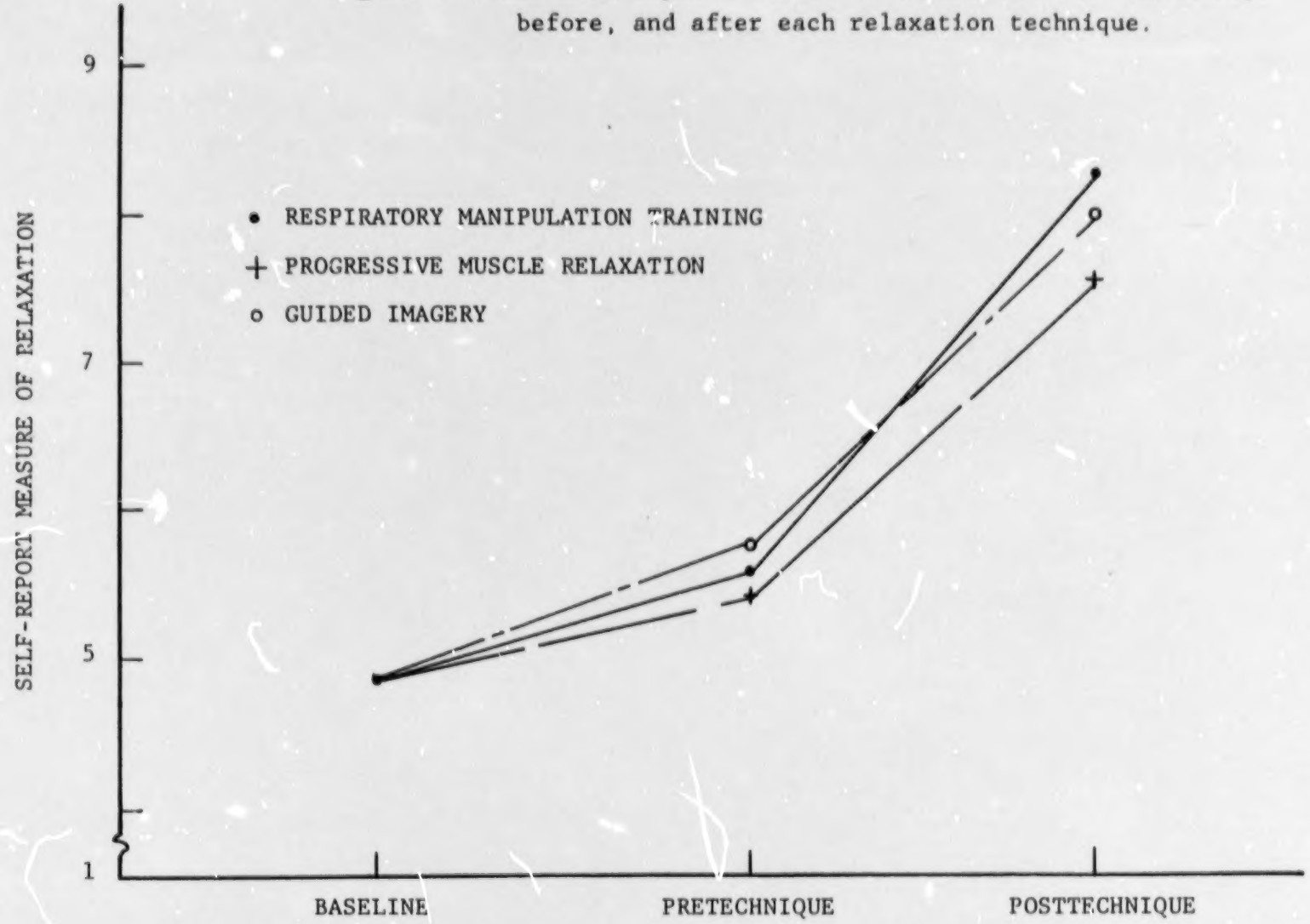


Figure 4. Mean self-report measure of relaxation: at baseline, before, and after each relaxation technique.




Note. Self-report of relaxation was measured on a scale from #1, 'not relaxed', to #10, 'completely relaxed'.